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EMERGENT EVOLUTION
AND THE DEVELOPMENT OF SOCIETIES

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EMERGENT EVOLUTION
AND THE
DEVELOPMENT OF SOCIETIES

BY
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PREFACE

The first part of the following volume is one of four addresses in a symposium on "Emergence" held at the Sixth International Congress of Philosophy, at Cambridge, Mass., September 14, 1926, and was published in the Proceedings of the Congress during 1927. It had previously appeared in *Science* (November, 1926) and in *Psyche* (January, 1927). The second part has been added for the purpose of calling attention to certain historical statements on "Emergence" and to the works of a number of contemporary authors who hold similar views.

Since the publisher has generously included this article in his "New Science Series", I seize the opportunity to introduce several changes. Owing to the fact that the original paper was presented to an audience familiar with

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the principle of "Emergence" and its implications, parts of the text must have seemed rather opaque or cryptic to the general reader. I have therefore rewritten the introduction and have endeavored to clarify or illustrate my meaning in some of the other paragraphs. The bibliography has been somewhat expanded.

W. M. WHEELER.

Bussey Institution,
Forest Hills,
January, 1928.

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We have hitherto failed in our comprehension of life mainly because we have been involved in the absolute method of dealing with things—have been more intent on discovering what units are for themselves than on finding out how they are related to and influenced by the systems to which they belong.

E. Noble, "Purposive Evolution."

Toutes les fois que des éléments quelconques en se combinant, dégagent par le fait de leur combinaison des phénomènes nouveaux, il faut bien concevoir que ces phénomènes sont situés non dans les éléments, mais dans le tout formé par leur union. Appliquons ce principe à la sociologie. Si, comme on nous l'accorde, cette synthèse sui generis qui constitue toute société des phénomènes nouveaux, différents de ceux qui se passent dans les consciences solitaires, il faut bien admettre que ces faits spécifiques resident dans la société même qui les produit, et non dans ses parties, c'est-à-dire dans ses membres.

—Durkheim, "Les Règles de la Méthode Sociologique."

Notez qu'étudier les individus ne veut pas dire que l'on doit considérer plusieurs de ceux-ci mis ensemble comme une simple somme; ils forment un composé, lequel, à l'égal des composés chimiques, peut avoir des propriétés qui ne sont pas la somme des propriétés des composants.

—Pareto, "Traité de Sociologie Générale."

Part I

EMERGENT EVOLUTION AND THE DEVELOPMENT OF SOCIETIES

The words "emerge," "emergent" and "emergence" are now employed so frequently and have sometimes been employed so loosely that it behooves an author to define the precise meaning he wishes them to convey. "To emerge" may, of course, signify that something comes up out of a liquid after being immersed, like a grebe or a loon out of a lake, or that something comes into view after concealment, like the sun when the clouds disperse. The verb is also occasionally used of facts that are revealed as the result of an inquiry or of questions or difficulties that suddenly crop up. In a more technical sense it is employed by entomologists when they say that a butterfly emerges from its chrysalis (in the sense of the

German "entpuppen"), in order to avoid the word "hatch", which they restrict to the issuing of the caterpillar from the egg. In all these cases, except that of a difficulty, the something emerging is supposed to preëxist and merely to become visible or manifest. The difficulty said to "emerge" or "arise" leads naturally to a consideration of "emergency", which does not connote preëxistence but the sudden and unexpected outcome of a critical, or contingent constellation of events, or happenings calling for immediate intervention. The two meanings now conveyed by the words "emergence" and "emergency" might therefore be called the preformational and the epigenetic respectively. They were not clearly distinguished by some of the writers of the past century, or at any rate the words were sometimes used interchangeably, and this is true also of the adjective "emergent" and its noun derivative. There is a third meaning

of "emergence" or "emergency" which is so epigenetic as to deserve the epithet miraculous. Kallen, in his admirable book, *Why Religion,* states that "Mary Morse Baker Glover Patterson Eddy, the founder of the (Christian Science) sect, records that she had been healed of an incurable disease by 'emergency into the light' ". Mrs. Eddy may have meant that, after preexisting as an incurably diseased metaphysical chrysalis, she suddenly burst into the spiritual light as a healthy metaphysical butterfly, though it seems more probable that she uses "emergency" in the sense of a miraculous change of belief. But all exegesis in such cases is apt to take too much for granted. In religious writings words should always be used in such a way as to connote the greatest possible number of meanings, so that the theologians may not lack for employment.[1]

[1] Indeed, the writers of the most successful sacred texts, such as the Bible, the Koran, the Book of Mormon and Science and Health, have subconsciously

Now "emergence", in the following pages, signifies neither the manifestation or unveiling of something hidden and already existing, as in the common and the entomological denotations of the word, nor some miraculous change, as in Mrs. Eddy's conversion, but a *novelty of behavior* arising from the specific interaction or organization of a number of elements, whether inorganic, organic or mental, which thereby constitute a whole, as distinguished from their mere sum, or "resultant".

conformed to this practice, which was long ago psychoanalyzed by Lucian in *The Dream, or the Cock.* The cobbler Micyllus is astonished to hear his cock suddenly remark in excellent Greek that he is a reincarnation of Pythagoras. Of course, the cobbler cannot help asking him why, if he is Pythagoras, he has been eating the beans that were cast before him, since that worthy had made the eating of beans *taboo.* The cock is ashamed and embarrassed, but finally confesses: "There was no sound or good reason, but I saw that if I should believe what was customary and the same as the masses, I would, in a very small measure, draw men to the wonder. The more odd I might be, the more reverence I thought I would receive from them. On this account I decided to introduce something new, keeping the cause of it a secret, in order that one conjecturing in one way and another in another, they might all be amazed just as they are in the mysteries of the oracles". (D. C. Brown's translation.)

The classical example is, of course, such a chemical compound as H_2O, in which hydrogen and oxygen combine under certain conditions and in certain proportions to form a liquid emergent, water, exhibiting a very different behavior (properties) from that of either of its gaseous components. In this sense, "emergence" acquires the epigenetic meaning of "emergency", and G. H. Lewes (1875), who was the first to use the word to designate such chemical behavior, probably had this meaning in mind.[1] The distinction between sum and emergent had been previously recognized by J. S. Mill (1843), who derived the latter from "heteropathic causation". L. F. Ward and Spaulding prefer "creative synthesis". Wundt uses the term "creative resultants", Sellars "evolutionary naturalism", C. L. Morgan "emergent evo-

[1] "There are many ways in which the properties of a mass differ from those of its molecules; the chief of them is, that some properties are *emergents*, not resultants."

lution", Broad "emergent vitalism", Smuts "holism", L. J. Henderson and others "organicism". I have adopted C. L. Morgan's term because it seems most applicable to the matters which I wish to discuss.

Emergence, as above defined, is a favorite concept, especially with a number of contemporary American and British realistic philosophers and biologists, including Holt, Spaulding, Sellars, Alexander, C. L. Morgan, Gordon, C. K. Ogden, G. H. Parker and Jennings, all of whom have stressed the unique qualitative (*i.e.,* behavioristic) character of organic and inorganic wholes as due to the peculiar non-additive relations or interactions among their parts. Since the various sciences are concerned with the investigation of wholes of different degrees of complexity, this conception is, perhaps, implicit also in Comte's hierarchy of the sciences, to which we still adhere, and in our various chemical and

biological classifications. According to Spaulding, *"certain specific relations* recognized, named and *technically formulated in special sciences, organize* parts into wholes, and there are states of affairs resulting (we should now say 'emerging') that are identical with new properties, and that are different and distinct from the individual parts and their properties. Therefore the *reduction* of these new properties to those of the parts *in the sense of identification,* and the finding of a *causal determination* also in this same sense is *impossible.* The properties of the whole are, at least some of them, new, and in just this respect *are a 'law unto themselves'* and *in this sense free.* This does not mean that they are lawless, but only that their specific principles of 'behavior' are not identical with those of the parts." [1] And, paraphrasing the

[1] This matter has been more fully considered by Broad (p. 77):

On the emergent theory we have to reconcile ourselves to much less unity in the external world and a

dictum that to be determined by one's own nature is to be free, he adds *"Freedom consists, therefore, of action in accordance with those characteristics which subsist at a certain level of or-*

much less intimate connection between the various sciences. At best the external world and the various sciences that deal with it will form a kind of hierarchy. We might if we liked keep the view that there is only one kind of stuff. But we should have to recognize aggregates of various orders. And there would be two fundamentally different types of law, which might be called "intra-ordinal" and "trans-ordinal" respectively. A trans-ordinal law would be one which connects the properties of aggregates of adjacent orders. A and B would be adjacent and in ascending order, if every aggregate of order B is composed of aggregates of order A, and if it has certain properties which no aggregate of order A possesses and which cannot be deduced from the A properties and the structure of the B-complex by any law of composition which has manifested itself at lower levels. An intra-ordinal law would be one which connects the properties of aggregates of the same order. A trans-ordinal law would be a statement of the irreducible fact that an aggregate composed of aggregates of the next lower order in such and such proportions and arrangements has such and such characteristic and non-deducible properties. If we consider the properties of a given aggregate of high order we could then divide them into three classes. (1) Those which are characteristic of this order, in the sense that all aggregates of the order possess them, that no aggregate of lower order does so, and that they cannot be deduced from the structure of the aggregate and the properties of its constituents by any law of composition which has manifested itself in lower orders. These might be called the "ultimate characteristics" of the order.

ganization but do not exist at other (lower) levels, yet is quite compatible with law and determination both at this higher level and at lower levels. Freedom of this kind subsists *at each level* of reality in the universe, not only in the mental but also through the physical and the merely subsistent realms." It is perhaps unnecessary to point to the essential similarity between emergence as thus understood and the *Gestalt* of the configurationists, Wertheimer, Koehler, Koffka, Drexler, etc.

There is evidently danger of conceiving the emergents in a fashion too schematic, too rigid and too static. The whole constituted by the organized and integrated parts need not be regarded as novel in its entirety. The novelty is

(2) Those which are characteristic of this order; but which could in theory be deduced from the structure of the aggregate, the properties of its constituents, and certain laws of composition which have manifested themselves, in lower orders. These might be called "reducible characteristics" of the order. (3) Properties which aggregates of this order share with those of lower orders. These might be called "ordinally neutral properties."

variable and may be evident only in certain functional aspects of the whole. Since wholes have a manifest cumulative tendency to combine and recombine to form ever more complicated wholes the ascending hierarchy of emergents has been much stressed. It is far from being universal, however. By loss or simplification of parts or suspension of some of their interactions, there is also an "Abbau", or unbuilding, productive of simpler emergents. This is clearly seen in the many recessive mutations of plants and animals and in the numerous secondary simplifications in such forms as parasites and other highly specialized organisms which are demonstrably descended from more complicated and nevertheless more primitive and generalized ancestors. There is, therefore, an evolution by atrophy as well as an evolution by increasing complication, and both processes may be going on simultaneously and at varying rates in

the same organism. We must also remember that most authors artificially isolate the emergent whole and fail to emphasize the fact that its parts have important relations not only with one another but also with the environment and that these external relations may contribute effectively towards producing both the whole and its novelty. This tendency to abstraction has led Professor H. C. Brown to remark that "the whole is then physically more than the sum of the parts *we have taken account of*, although these may be legitimately abstracted as sufficient for correlation with the consequences of the integration. The extraordinary sense of mystery some seem to feel about the process appears to me to arise from forgetting this interstitial filling that is as real as the selected elements and renders technically false the literal interpretation of the appealing parodox of the whole that is something more than the sum of its parts".

If all wholes of which the parts are organized, or exhibit those relations which we call integration, differentiation ("division of labor"), interactive accumulation, etc., among themselves and with the environment, are emergents, we must agree with Morgan that "it is beyond the wit of man to number the instances of emergence". Since no two events are identical, every atom, molecule, organism, personality and society is an emergent and, at least to some extent, a novelty. And these emergents are concatenated in such a way as to form vast ramifying, or sympodial systems, only certain ideal sections of which seem to have elicitated the attention of philosophers, owing to their avowedly anthropocentric and anthropodoxic interests. These sections have been called levels. The word is not very apt since it conveys a spacial and static metaphor, whereas emergents must be regarded as intensively manifold spaciotemporal events. Naturally

no two authors agree in their lists of levels. Metaphysicians and epistemologists like Alexander and Morgan are mainly interested in space-time, matter, life, mind and deity as successive emergent levels. To the biochemist, biophysicist, biologist, and physiological psychologist, however, life and mind are so amazingly complex and comprise so many heterogeneous processes that their blanket designation as two emergent levels can not seem very illuminating, and to the observer who contemplates the profuse and unabated emergence of idiots, morons, lunatics, criminals and parasites in our midst, Alexander's prospect of the emergence of deity is about as imminent as the Greek Kalends.

Our knowledge of organisms and their development will hardly permit us to accept such levels as life and mind as having been established *uno ictu*. Emergence must be more ambulatory, or at any rate less saltatory. If the

naturalist is to accept both genetic continuity and novelty in evolution, the viable novelty at each emergence must be very small indeed.[1] This is attested both by the extraordinary slowness of phylogeny and the very subtle transitions in even the most rapid ontogenies. Even metamorphosis in organisms is only superficially saltatory. Novelties such as life and mind, conceived in a wholesale fashion, are of such magnitude that we can regard them only as representing the final accumulative stages of a very long series of minimal emergences. The insistence on levels becomes, therefore, largely a matter of descriptive emphasis and should not conceal the necessity for detailed scientific knowledge of every emergence and the peculiar constellations and interactions of the parts which immediately determine it.

One of the levels in which the situa-

[1] I have used the word "viable" intentionally because monsters and other extreme unadapted mutations are also emergents.

tion, as it appears to me, is most open to investigation, is the social. Unfortunately the subject has been passed over by writers on levels with only a few vague remarks. Unfortunately, also, the science of comparative sociology has remained undeveloped. It has, in fact, fallen between two stools, because the sociologists have left the study of animal and plant societies to the biologists and the latter have been less interested in these societies as such than in the structure or individual activities of their members. Apart from Forel and myself only a few investigators, like Espinas, Waxweiler, Petrucci, Deegener, and Alverdes have evinced a keen interest in nonhuman societies. Yet these, no less than human society, are as superorganisms obviously true emergents, in which whole organisms, *i.e.* multicellular organisms, function as the interacting determining parts. Owing, moreover, to the loose and primitive character of the in-

tegration and the size of the components even in the densest societies, it is possible to ascertain the behavior of the parts and to experiment with them more extensively than with chemical and organismal wholes, since the parts of the latter are either microscopic or ultramicroscopic and are always so compactly integrated that analysis becomes very difficult and involves a considerable amount of statistical inference. Experiments in subdividing, compounding, castrating and grafting, and in introducing foreign elements with a view to observing their effects on animal and plant societies as emergent wholes, can be carried far beyond the limits of such experiments on the single living organism. For this reason, for the reason that there is a much greater wealth of emergents at the social level than is commonly supposed, and because the peculiarities of social emergence bear an interesting analogy to those of mind, the reader will par-

don me if I descend to a rapid review of a number of biosociological details.

Social aggregates—if we employ the term "social" in its broadest sense—may be divided into two great groups, the heterogeneous and the homogeneous, the former comprising the associations of organisms belonging to different species, the latter of individuals of the same species and therefore of common genetic origin. In either group the simplest association obviously obtains between two interacting individuals, the combined behavior of which may be said to form an emergent pattern different from, though depending on, the functional peculiarities of the two component organisms.

Among the heterogeneous association we can distinguish the innumerable cases of predatism, parasitism, symbiosis and the biocœnoses, or animal and plant communities, which constitute a vast series of emergents varying from those of very low to those of very high

integration. In predatism, the predator becomes structurally and behavioristically adapted to the prey and the latter to the predator, at least to the extent of modifying its habits of flight, concealment, defense or fecundity. In these cases we can hardly speak of association in the social sense, but it may be noted that if the predatory species indulges in too great an extermination of the prey, it must either adapt itself to some other form of prey, or automatically cease to exist. In parasitism this danger is the greater because the association of host and parasite is so close as to be usually one of actual bodily contact. Moreover, the parasitic association which is exhibited, either temporarily or permanently, by many thousands of animal and plant species, tends to ever greater refinement through the selection of specific hosts by the parasites. This type of association is unilaterally aggressive like predatism, but tends in turn to

lapse into a relation of mutualism, or symbiosis between the interacting individuals, again giving rise to innumerable emergents exhibiting such diverse behavioristic wholes as the symbiosis (helotism) of alga and fungus in the lichens, the association of bacteria or Mycorrhiza with the roots of higher plants, the singular associations of pollinating insects with flowers, between the yeasts or bacteria and the tissues of plant lice and other insects, between ants and certain tropical trees and shrubs, the cultivation of fungi by beetles, ants and termites, etc. Recent studies like those of Raines (1922) on the rusts and their host-plants and of Melin (1925) on Mycorrhiza and the roots of forest trees, show the various predatory, parasitic and symbiotic associations as emergents *in statu nascendi*. Finally there are the biocœnoses, or communities of plants and animals that live in particular environments, such as swamps, deserts, rain-

forests, etc.—veritable welters of organisms of many species, all interacting with one another in complex predatory, parasitic and symbiotic relationships, but forming wholes in which the experienced field-naturalist can readily distinguish general adaptive patterns, though their adequate description may be impossible. In the tropics a single species of tree may harbor and nourish more than a hundred species of insects peculiar to itself and these may, in turn, be the prey of many predatory insects, reptiles, birds and mammals and the hosts of innumerable fungus, protozoan, vermian and insect parasites. We may truthfully say that there is not on the planet a single animal or plant that does not live as a member of some biocœnose.[1]

[1] Classical examples of biocœnoses are the clover—bumblebee—fieldmouse—cat—spinster community of Darwinian literature and the maize plant—cornroot aphis—ant—horse—man community of our Midwestern corn-belt. For more intricate examples and an interesting discussing of the biocœnoses from the ecological and sociological points of view, see Elton (1927).

True societies are possible only when the components belong to the same species, but the motives of their association may be very diverse. They may be said to belong to three main types according as nutritional, reproductive or defensive functions predominate in the emergent social behavior. Examples of the nutritional type are certain Cœlenterates, like the Siphonophores, corals, etc., the tunicates, tapeworms and the higher vascular plants. In all these cases the society, or colony, is formed asexually by repeated budding from a single individual, and sexual reproduction is restricted to the dissemination of the species and the formation of the initial individual of the colony. Certain members of the colony may be specialized for the purpose of securing food, but this is shared by all the vitally interconnected individuals.

The sexual, or reproductive, type of society is more interesting It starts with a peculiar temporary coöperation,

or mating of only two individuals, the male and the female, and emerges with the growing up of the offspring in co-operative affiliation with the mother or with both parents. A more or less permanent family is thus formed, which may become very numerous either through the production of successive generations of offspring by the same mother or through the consociation of a number of genetically related mothers and their offspring. This is the type of society which we find among the insects, and I have been able to show that it has emerged at no less than thirty independent points during the phylogeny of the class. Some of these colonies are very small and evanescent or feebly integrated, but others are very stable, comprise many thousands of individuals (ants, honey-bees, social wasps and termites) and are very highly integrated, with so pronounced a social division of labor among the individuals that definite castes are pro-

duced (workers, soldiers, etc.) which are not only functionally, but may even be morphologically differentiated at an early stage of their post-embryonic development. Although the formation of the various castes is primarily connected with the functions of nutrition and defense the main activities of the colony center in reproduction, *i.e.,* in producing and rearing as many young as possible. That the social activities may present a very definite emergent pattern is most clearly seen in the nests of bees, wasps, ants and termites. These structures, though the result of the coöperative labor of most of the personnel of the colony, are nevertheless true *Gestalten,* being no more mere sums of the individual activities than is the diverse architecture of cities built by human hands. Not only does each species have its peculiar type of nest, but the nest of every colony of a species exhibits its own emergent idiosyncrasies.

The situation among the social insects may be complicated in a very interesting manner by the tendency of their colonies to adopt alien insects as guests, or nestmates. This is especially true of the ants and termites. These guests are really social parasites and are to be regarded as component members of the colonies in the same sense as dogs have for ages been effective members of human societies. But in the case of the social insects the behavior of the guests may produce veritable social diseases in the colonies that harbor them. As a result of their adoption even the structure and numerical proportions of the castes may be modified, although there is a demonstrable effort at social regulation on the part of the host, just as there is in the single organism whose tissues have been invaded by bacteria or other parasites. This tendency to consociation with strange organisms is carried even further in the union of whole colonies of bees, wasps, and ants

with colonies of alien species, and in these so-called "mixed colonies" one of the social components assumes a predatory or parasitic rôle, suppressing the fertile queen, or reproductive organ of the host colony, *i.e.,* indulging in what is known as "parasitic castration" among single organisms, and controlling the activities of the whole, so that a new emergent arises—a super-superorganism, or superorganism of the second degree.

The defensive colonies are represented by the schools, flocks, herds and bands of fishes, birds and mammals and consist of individuals, sometimes of only one sex or of the young, belonging to different families. While these congregations are usually based on sexual reproduction, their primary social function is nevertheless the protection of the individuals. There is often a vague differentiation of function as in the stationing of sentinels or of more vigorous or more formidable in-

dividuals in strategic positions when the herd is feeding or is otherwise exposed to danger. The bands of monkeys, anthropoids and primitive men constitute loose social aggregates of this pattern. We must, I believe, regard human societies above the level of the primitive savage horde as still higher emergents, *i.e.,* as super-superorganisms which not only have their reproductive basis in the consociation of numerous families, but have developed innumerable groups, or associations, all so inextricably interrelated that a single individual not only has multitudinous relations with the members of his own and other families, but may belong simultaneously to a number of different associations. The total emergent functional pattern is here so amazingly complicated that it altogether defies observation as a whole. Only in certain cases, such as ceremonials and rituals, is it possible to observe emergent social patterns as wholes, or *Gestalten.* A

fine example of such a pattern, covering a wide area and many activities and carried out by many individuals, though unperceived by the latter, is the *kula* among the natives in the archipelagoes of Melanesian New Guinea as described by Malinowski in his *Argonauts of the Western Pacific.*

Whereas nearly all insect societies possess an ontogeny, since they have their inception in a single fecundated mother queen and exhibit a gradual growth, integration and differentiation as new individuals are successively added from the eggs of the queen till the colony attains a definite adult stature in a manner analogous to that of the ontogeny of the single organism by division and differentiation of its component cells, human society no longer possesses an ontogenetic stage but grows indefinitely by a kind of interstitial swarming, which resembles that of the honey bee only when contingents of individuals are sent out as

colonies, as occurred in ancient times among the Greeks and Romans and has been the practice of other European nations during more recent centuries.

Now the various emergents which I have very briefly discussed indicate that there is something fundamentally social in living things, and closer scrutiny shows that this must be a characteristic of all life, since every organism is, at least temporarily, associated with other organisms, even if only with members of the opposite sex and with its parents, and every organism is at least implicated in some biocœnose. This statement holds good even of such supposedly unsocial creatures as lions, eagles, sharks, tiger-beetles and spiders. There are, in fact, no truly solitary organisms. We may say, therefore, that the social is a correlate as well as an emergent of all life in the sense in which Morgan speaks of mind as being both a correlate and an emergent of life. And like the more complicated

mental emergents, such as the instincts and conscious activities, striking social emergents make their appearance sporadically and often in unrelated groups of species, as I have shown among the insects.[1] Indeed, the correlations of the social—using the term in its most general sense—even extend down through the inorganic realm to the very atom with its organization of component electrons. And since reality is given as classes of elements, each represented by innumerable similar, active entities, endowed with an irresistible tendency to cohere and organize themselves into more and more complex emergent wholes, association may be regarded as the fundamental condition of emergence. We are, I believe, bound to assume that the organization *is entirely the work of the components themselves* and that it is not initiated and directed by extraspacial and extra-

[1] This matter is fully discussed in my *Social Life Among the Insects,* 1923, and *Insect Societies* (International Library of Psychology, etc.), 1928.

temporal "entelechies" (Driesch) "organizatory factors" (Eldridge), "deity" or "élan vital" (Bergson). Such agencies are conceived as possessing remarkable foresight, although the whole multimillennial course of evolution with its innumerable *impasses* and *culs-de-sac,* its abject and tragic failures, would seem rather to be one vast monument to their colossal and hesitating inadequacy, blindness and stupidity. The resort to such metaphysical agencies has been shown to be worse than useless in our dealings with the inorganic world and it is difficult to see how they can be of any greater service in understanding the organic. The tender-minded may still delight in assuming their intervention in the development and maintenance of unicellular and multicellular organisms, whose integration is so exceedingly complicated and opaque that we are probably still centuries removed from any adequate understanding of their functional com-

position, but on the next level, that of the very loosely organized social, or super-organisms, in which the actual play of the components is open to inspection, it is not so easy to tolerate these ghostly presences.

I fail to understand why Alexander and C. L. Morgan select deity as the supervenient level next to mind, since their general scheme of emergent evolution most naturally demands the social as the next level in ascending order. As I. A. Richards says (*Science and Poetry*, p. 60): "Various emergent deities have been suggested—by Mr. Wells, by Professors Alexander and Lloyd Morgan—but, alas! the reasons for suggesting them have become too clear and conscious. They are there to meet a demand, not to make one; they do not do the work for which they were invented. The revolution brought about by science is, in short, too drastic to be met by any such half-measures. It touches the central prin-

ciple by which the Mind has been deliberately organized in the past, and no alteration in beliefs, however great, will restore equilibrium while that principle is retained." Were prophecy in order we might ask what level may be expected to emerge beyond the social. Perhaps this may be the end of the series, with supervenient extinction, also to be accepted by the race with good cosmic manners if not with Morgan's "natural piety". It would seem, however, that the present very imperfect state of our society may allow for not a few successive emergents in the form of greater solidarity and higher ethics. But here we touch on a consideration which even Herbert Spencer felt to be ominous. Will this prospective, more intensive socialization be analogous to that of the highest social insects, a condition in which specialization and constraint of the single organism are so extreme that its independent viability is sacri-

ficed to a system of communal bonds, just as happens with the individual cell in the whole organism?

Within the groups of social insects, as we pass from the socially primitive to the more specialized, or in the ontogeny of the single colony as we pass from its earlier to its later stages, we actually witness a notable and increasing degeneration of the individual. Holmgren has shown that the supraœsophageal ganglion, or brain, in old kings and queens of termites shrinks to one-third, while the sympathetic ganglia increase to three times their original size. And von Rosen finds that the eyes and optic ganglia of aged royalty among termites also undergo marked degeneration. Furthermore, the eyes, brain, thoracic structure and often also the pigmentation of the workers in the most highly socialized ants are less developed than they are in the workers of small primitive socie-

ties, which are more like the original solitary Vespoid ancestors. There may even be a complete suppression of the worker caste and a return, or dedifferentiation to what is, to all intents and purposes, a nonsocial life in certain ants, bees and wasps (Anergates, Psithyrus, *Vespa austriaca,* etc.) which behave as parasites in the colonies of other ants, bees or wasps. We also notice a concomitant degeneration in pigmentation and other structures as we pass from primitive forms like Calotermes, Archotermopsis and Hodotermes, with their small colonies, to Termes with its huge colonies of highly specialized individuals. Many more examples might be cited but these will suffice to show that evolution by atrophy certainly accompanies an advance in social integration in the insects.

Turning to man we notice a similar regressive development of the individual as civilization proceeds. There is

a decline in the sense-organs (witness the number of people with congenital or acquired defects of vision, hearing and smell), anomalies in the epidermal structures (teeth, hair and pigmentation), the absence of any demonstrable improvement in the brain cortex and intelligence during historic time (possibly even some deterioration!), the greater activity of the visceral nervous system and endocrine glands as shown by the higher emotivity, increasing insanity, criminality, and mob-psychology in our larger cities, etc. Add to all this the atrophy or subatrophy of our organs and tissues brought about by the ever-increasing specialization in our activities, and we can hardly fail to suspect that the eventual state of human society may be somewhat like that of the social insects—a society of very low intelligence combined with an intense and pugnacious solidarity of the whole. Even the intensification of nationality witnessed in existing human

society has its counterpart in the hostility of every colony of social insects towards every other colony, even of the same species. A society of the type towards which we may be drifting might be quite as viable and quite as stable through long periods of time as the societies of ants and termites, provided it maintained a sufficient control of the food supply.

Intersocietal hostility undoubtedly has its roots in the mutual hostility of the individuals, both of the cells or tissues of single organisms and of the individual organisms composing superorganisms, and this "hostile symbiosis" is the foundation on which Morley Roberts has recently erected a very interesting theory of evolution. The primitive predatism and parasitism from which symbiosis has emerged is not lost by the individuals composing organisms or societies but merely abides in latency, as the most casual observation of our species demon-

trates, ready to flare up under certain conditions with the most disastrous results, such as the death of the individual (cancer and other malignant growths and variations) or the dissolution of society (revolution). It follows from such considerations that the optimistic conception of progress as an unceasing movement towards perfection in the human race may be illusory. Roberts suggests that our enlarged fore-brain, the "specific organ of civilization" (C. J. Herrick), with its ninety-two hundred million neurons, of which we are so proud, may really have originated as a malignant overgrowth (tumor), and he remarks that "in discussing the factors of evolution objections to our regarding the encroachments of the fore-brain upon the animal function of the human body as perpetual approximations to and recessions from a state of morbid overgrowth, on the ground that to this we owe human progress, are wholly ir-

relevant. Progress, whatever it may be, is obviously relative and a healthy Neanderthal or Cromagnon man, who might as easily dispose of a modern athlete as any gorilla, could be held excused if he thought his bald and almost jawless successor to be in the highest degree degenerate. There can be no doubt that what we, perhaps in our blindness, call the upward progression of the human race, has always been accompanied, especially when advance seemed most rapid, by an increase in disease, and it would in no way be surprising if we learnt at last that the remarkable increase in the fore-brain was not only one of the causes of malignancy but was to be in the end one great cause of the extinction of man. If that proved to be a fact, such a result would but class man as one of the many races of animals which perished of special over-growths and a possible lack of fertility."

The degenerate or pathological char-

acter of civilization has been emphasized by many authors, including Ruskin and Carpenter. The following is from the poet Schiller (*Ueber die ästhetische Erziehung des Menschen,* 1795) and is quoted by Jung in his *Psychological Types,* p. 91: "I do not ignore the advantages which the present generation, regarded as a whole and measured by reason, may boast over what was best in the by-gone world; but it must enter the contest as a compact phalanx and measure itself as whole against whole. What individual modern could enter the lists, man against man, and contest the prize of manhood with an individual Athenian? Whence then arises this unfavorable individual comparison in the face of every advantage from the standpoint of the race?" The philosopher F. C. S. Schiller is even more explicit, when he says (in his brochure, *Tantalus*): "It appears then that we can extract no guarantee of progress from

the nature of man or from the nature of human institutions. There is no *law* of progress! * * * Civilization, as at present constituted, is very definitely a deteriorating agency, conducing to the degeneration of mankind. This effect of civilization is nothing new;—its discovery, however, is very recent." In the writings of Stärcke ("Psychoanalysis and Psychiatry," *Internat. Journ. Psycho-Anal.* 2, 1921, p. 361-415), who actually dubs the disease of civilization "metaphrenia," I find the following remarks: "Civilization seems then to be a disease which is imposed on a certain portion of society in order to obtain a certain extra gain whereby all profit. . . . Civilization from the individual point of view belongs to neurotic phenomena. . . . We see the civilization of a people or a race built up in cycles according to the mechanisms of the obsessional neurosis, until it becomes no longer bearable; then there comes about a limita-

tion of the useful effect through the return of the repressed material in disguised form, and a breaking through of forbidden things in war and revolution, according to the principles of the manic psychoses, while various 'isms' analogous to the paranoid fields are not lacking. . . . Civilization demands regression," etc.

Yet other considerations, to which the intelligence testers and psychoanalysts have been calling our attention for some years past, indicate that as civilization proceeds, most of us find it increasingly difficult to advance beyond, or increasingly easy to lapse into juvenile or even infantile modes of thought, feeling and behavior. It would seem that these tendencies must be due, at least partially, to the increasing pressure of prophylaxis and protection exerted by the controlling classes of society on all its members. We are succeeding so well in making everything "fool-proof" for one an-

other that even the baby termites might envy us our individual security.

The prospect is by no means pleasant. The reader will be delighted, I am sure, that I refrain from further comment.

Part II

SOME EARLY AND CONTEMPORARY ORGANICISTS

The organicist view of Nature, implying as it does the notions of "emergence" and *"Gestalt"*, seems to be older and to have been more widely entertained than present discussions might lead us to believe. The theory of the organism as different from a sum of its parts and as depending on their "mixture" or structural arrangement goes back at least to G. E. Stahl (1660-1734), J. C. Reil (1759-1813) and C. A. Rudolphi (1771-1832). This is shown by Nordenskiöld (1926) in his discussion of these investigators. Stahl was, of course, an arrant vitalist, but both Reil and Rudolphi would be regarded by most biologists as thorough-

bred mechanists. As we approach the middle decades of the nineteenth century we come upon statements of greater interest in regard to emergence in two of the most illustrious of physiologists, du Bois-Reymond and Claude Bernard. The former, in the preface to his monumental work on animal electricity (1848, p. 46), in the midst of a violent attack on the vitalism of his day, asks the following questions: "If organisms exhibit appearances which are not seen in inorganic nature, may this not be due simply to the fact that their material particles, though endowed with the very same and with no other properties than those occurring outside of organisms, nevertheless enter into new relations to one another and form new combinations? Is it any wonder that these should be able to act in novel ways?"

Claude Bernard's statement is more startling and comprehensive. It occurs in his *Introduction to the Study*

of Experimental Medicine, published in 1865.

I quote from Greene's recent translation (1927, p. 90):

"In chemistry, synthesis produces, weight for weight, the same body made up of identical elements combined in the same proportions; but in the case of analyzing and synthesizing the properties of bodies, *i.e.* synthesizing phenomena, it is much harder. Indeed, the properties of bodies result not merely from the nature and proportions of matter, but also from the arrangement of matter. Moreover, as we know, it happens that properties, which appear and disappear in synthesis and analysis, cannot be considered as simple addition or pure subtraction of properties of the constituent bodies. Thus, for example, the properties of oxygen and hydrogen do not account for the properties of water, which result, nevertheless, from combining them.

"I do not intend to go into those difficult yet fundamental problems about the relative properties of combined or combining bodies; they will find their proper place elsewhere. I shall here only repeat that phenomena merely express the relations of bodies, whence it follows that, by dissociating the parts of a whole, we must make phenomena cease if only because we destroy the relations. It follows, also, in physiology that analysis which teaches us the properties of isolated elementary parts can never give us more than a most incomplete ideal synthesis; just as knowing a solitary man would not bring us knowledge of all the institutions which result from man's association, and which can reveal themselves only through social life. In a word, when we unite physiological elements, properties appear which were imperceptible in the separate elements. We must therefore always proceed experimentally in vital synthesis, because

quite characteristic phenomena may result from more and more complex union or association of organized elements. All this proves that these elements, though distinct and self-dependent, do not therefore play the part of simple associates; their union expresses more than addition of their separate properties. I am persuaded that the obstacles surrounding the experimental study of psychological phenomena are largely due to difficulties of this kind; for despite their marvelous character and the delicacy of their manifestations, I find it impossible not to include cerebral phenomena, like all other phenomena of living bodies, in the laws of scientific determinism". Not improbably, J. S. Mill, Lewes and Bain, to whom C. Lloyd Morgan and Sir W. Leslie Mackenzie (1926) trace the notion of emergence, may have been familiar with these statements or with others of like import in the works of less eminent physiologists.

Organicist views of human society have long been held by sociologists, as appears from numerous passages in the works of Auguste Comte, Herbert Spencer, Lester F. Ward, Durkheim, Pareto and many others. Barth, Bristol and Ferrière have discussed the organicist views of Spencer, von Lilienfeld, etc. at great length and have easily refuted these authors when they attempt to establish detailed analogies between the structure, functions and behavior of societies and those of their constituent individuals. Much of this thinking might have been avoided had the social organicists frankly appealed to the principle of emergence, since the analogies between different organic levels may be very general or vague without destroying their essentially organic character. But neither do the critics seriously invoke emergence, and Barth's and Ferrière's knowledge of animal sociology is so superficial that they often fail to notice some of the

most striking analogies such as that between the ontogeny, growth and decay of insect societies and similar processes in the individual organism.[1]

The distinguished psychologist, Wilhelm Wundt, was so greatly impressed with the importance of emergence that he included it with other outstanding principles, such as his "heterogony of purposes", in the concluding section of the last volume of his ponderous *Grundzüge der physiologischen Psychologie.* His introductory statement is somewhat involved but is worth translating not only as an expression of

[1] While Ward was familiar with the principle of emergence, or "creative synthesis", as he called it, he seems never to have thought of applying it to social phenomena. The same appears to be true of Spencer who, like Ward, attempted to derive the peculiarities of societies from those of their components. How far he was from an appeal to emergence even in his chemical and biological discussions is shown on the very first page of his *Principles of Biology,* where he says: "The properties of substances, though destroyed to sense by combination, are not destroyed in reality. It follows from the persistence of force that the properties of a compound are *resultants* of the properties of its components—*resultants* in which the properties of the components are severally in full action, though mutually obscured".

opinion but also as a specimen of the genuine German *"Gelehrtenstil":*— "Wherever we may look around in the domain of those processes, which we designate in the broadest sense as 'psychic combinations' (Verbindungen), or—since all true psychic processes are composite and therefore combinations—wherever we may look around in the vast domain of psychic phenomena in general, their most salient characteristic, confronting us always and everywhere, is that the product arising from any number of elements is greater than the mere sum of the elements, that it is more than a product of the same kind as the elements or than one differing from them merely in qualitative and quantitative constitution, and is really a *new* structure (Gebilde) which so far as its essential properties are concerned is not to be compared with the factors that coöperated in its production. We will call this fundamental peculiarity of

psychic occurrence the principle of *creative resultants*. The word resultant is intended to indicate that out of particular elements, susceptible of empirical demonstration, there arise creative resultants according to fixed laws (Gesetzmässigkeit), analogous to the manner in which the components of a mechanical movement produce their resultants. The adjective 'creative', however, is intended to emphasize the fact that the supervenient effect is not of the same kind or class of values (Wertgattung) as its components, as is the case in a resulting movement, but that it is something specifically new, provided for but not preformed in the elements, and that its value-character (Wertcharakter) is a new one and one of a higher level".[1]

That the principle of emergence is still advocated by sociologists is shown

[1] I find that Spearman ("The Nature of Intelligence," etc., p. 116) had previously translated the first part of this paragraph. His rendering may be more elegant but is hardly as successful as mine in reproducing the erudite uncouthness of the original.

by the following lucid passage taken from Sumner and Keller's recent monumental *Science of Society* (Vol. 3, 1927, p. 2220): "Human society, then, by the diversity of its parts, their specialization, the distribution of functions, the mutual service and support of the parts, and their solidarity, is a true system or organization. It has a life different from that of the individual and not simply aggregated or multiplied from the life of individuals. The quality of a combination is not the sum of the qualities of its components; no one could predict the characteristics of gunpowder from those of sulphur, charcoal, and saltpeter. One cannot juxtapose cells and judge what they will make. Similarly the juxtaposition of human qualities does not guarantee the quality of a society. The development of histology does not render physiology less indispensable. There is a body to study as well as a cell, a society as well as an individual; and the

body and the society are things with lives and laws of their own. Hence forces arise in the societal organization which are characteristically societal forces. They come into being because a society of humans of different sexes and ages, of various attainments, divergent tastes and desires, yet with certain broad and fundamental similarities has grown up. These forces operate in accordance with law, as all things do; and they produce phenomena which follow certain sequences. The forces combine, or cross, or counteract each other, in all possible ways and degrees, and the phenomena vary with the circumstances of the physical world or with the material on which the forces act."

We must also include among the organicists the well-known German zoologist Oskar Hertwig. In his comprehensive *Werden der Organismen* (1922) he mentions Karl Ernst von Baer, W. Pfeffer, Ed. von Hartmann

and Kuno Fischer as holding views similar to his own, which he expresses as follows: "Physics encounters the same difficulties as physiology whenever it is concerned with the peculiar effects produced by bodies as a result of their intrinsic composition or as chemical elements. Like every plant or animal species, every chemical body presents its special problem when its mode of action is traced to the behavior of its component elements, or, as commonly stated, to the elements which explain it. The same statement may be made in regard to properties as in regard to effects, since we cannot derive by simple addition the properties of the molecules from the properties of their constituent atoms, the properties of the cells from those of their molecular compounds, or the properties of animals and plants from those of their cells. We must say rather that the effects and properties of a composite whole are essentially deter-

mined by what the technician calls the configuration of a system consisting of simpler parts, *i.e.* by the conditions of the system. These still remain, nevertheless, under the influence of and in dependence on the general environment which acts upon them."

Among the recent studies of emergence which have appeared since 1925 the most elaborate is Gen. Smuts' volume (1926) on *Holism and Evolution.* This is the more remarkable because its author seems to have been quite unaware of the contributions to the subject by other thinkers. It is very suggestive as such earnest works by non-professionals are apt to be, but there are grave doubts in regard to his conception of "holism" as a "nisus", "inner driving force" or "operative factor" in Nature. As the Rt. Hon. J. M. Robertson (1926) says in his review of the book, "General Smuts rightly contends against some vitiating verbalisms in modern scientific thought, such as the

use of those unhappy terms "mechanism" and "mechanical" to label cosmic and biological processes. Yet his own philosophy culminates in that "hypostatizing of names" which Mr. Whittaker has justly declared to be the bane of much of ancient philosophy. General Smuts does not, I think, ever grapple with the problem of what is meant by "whole", "a whole" and "the whole". In his book they are, as Hegel said of a certain concept of Schelling's, "shot out of a gun". For many students they suggest implications of cosmic purpose. General Smuts does not theize, or dream of "divine events", or a controlling Providence; but he does something that is more confusing: he hypostatizes "whole" into "Hol*ism",* and actually conceives and speaks of that as a principle, a force—nay, the ruling force in the universe." A professional philosopher, Hoernlé (1926), reviews the book more favorably: "General Smuts

considers holism as a contribution to science rather than to philosophy. Scientists, absorbed in their special fields, do not generally indulge in comprehensive surveys of Nature, and do not, therefore, generalize the concept of whole so as to be co-extensive with the process of evolution. In scientific theory, therefore, holism is a new thing, and if scientists are willing to accept it, it will mean a re-orientation of scientific thought. Perhaps Professor A. N. Whitehead's new theory of organisms may turn out to be an independent attempt at a similar re-orientation. Philosophers, in their turn, must acknowledge a certain measure of originality in holism. True, in its synoptic character, in its concept of creative activity, in its account of evolution as a series of stages of ascending perfection, it runs along familiar lines. But, of the thinkers who have tried to base their philosophy on evolution, some, like Alexander and Lloyd Mor-

gan, have thought in terms of stages rather than of wholes; others, like James Ward, have acknowledged wholes, but made all their wholes spiritual, analyzing the universe as a society of spirits; yet others, like Pringle-Pattison, treat evolution as the self-revelation of God. Clearly, as against these, holism is a novel interpretation of the commonly accepted facts, a new reading of the character of cosmic evolution. The book with which, philosophically considered, it most nearly invites comparison is Prof. J. E. Boodin's masterly and comprehensive volume on Cosmic Evolution. In any case, General Smuts has written a book which is fresh in thought and vigorous in style, and which deserves far higher praise than the luke-warm *succès d'estime* that is generally meted out by professionals to the work of distinguished outsiders".

Three papers by E. S. Russell, C. R. Morris and Sir W. Leslie Mackenzie

and forming a symposium of the Aristotelian Society on emergence, are, on the whole, rather unfavorable to the notion. They are mainly concerned with the difficulties centering about conventional philosophical conceptions of "causality" and "explanation". None of the authors shows an adequate appreciation of organicist theory or of the facts which have led to its acceptance by scientists. For this reason Professor Lovejoy's paper (1926), which presents a trenchant analysis of emergence and its modes and deals with the objections advanced by these and other philosophers, is a most welcome and important contribution. His discussion is unfortunately too compact and too technically philosophical to admit of brief summary. The following paragraph, however, deals with one of the common objections to emergence:—"With the distinction between functional and existential emergents in mind we are also in a position to deal

with the commonest general or antecedent objection brought against theories of specific emergence. The objection was raised, in differing terms, by several participants in the recent discussion of the subject by the English philosophical societies. To characterize an effect as 'emergent', it is urged, is to give up the attempt to 'explain' it; and since science cannot give up this attempt, the characterization can have, at best, no more than a provisional validity, as a way of admitting that certain things have not as yet been completely 'explained'. Now, what sort of explanation is it that these critics desiderate in theories of emergence? 'Causal explanation' in the ordinary sense—the recognition that every event follows upon some other *nach einer Regel,* the 'determinism of the experimentalist'—is, as we have seen, entirely compatible with the belief in emergence. The sort of explanation which specific emergence, or emergent evolu-

tion, would exclude, is simply that demanded by the second form of preformationism—the conception of the effect as neither (a) manifesting any law, or mode of uniform behavior, nor (b) containing any existent, not found in its antecedent. To maintain, then, that everything is 'explicable' in the sense incongruous with emergence, is to raise a definite, though by no means simple, question of fact; it is to imply, for example, that, barring mere summations or rearrangements, there is to be found in the present phase of terrestrial history no existent whatever—no quality, type of entity, or kind of process—which could not already have been discerned by a scientific angel observing the cold-gaseous-nebula stage of the development of our solar system. This proposition cannot be said to have a high degree of *prima facie* plausibility; and its truth cannot be assumed *a priori* merely because it is one of the two conceivable ways of satisfying the

demand for a special type of so-called 'explanation' which is not practically indispensable to science, and which in one case—that of qualitative change in chemical synthesis—is certainly irreconcilable with patent facts."

Two other important papers have recently appeared, one by Prof. O. L. Reiser (1926) on *Probability, Natural Law and Emergence,* the other by Prof. H. S. Jennings (1927) on *Diverse Doctrines of Evolution, Their Relation to the Practice of Science and of Life.* The latter is the more interesting to the biologist because it is at the same time a vindication of his ideals of investigation by one who has contributed greatly to our knowledge of the behavior of the lower organisms and a vigorous tonic to those students of the organic who are forever fearful that biology may dissolve entirely into physics and chemistry. Jennings is convinced that "the doctrine of emergent evolution makes the biologist loyal

to experimentation and observation in his own field of work, whatever is found in other fields. Courage and defiance sprout from his soul in place of timorous subservience to the inorganic. No longer can the biologist be bullied into suppressing observed results because they are not discovered nor expected from work on the non-living parts of nature. No longer will he feel a sense of criminality in speaking of relations that are obvious in the living, for the reason that they are not seen in the non-living. Biology becomes a science in its own right—not through rejection of the experimental method but through undeviating allegiance to it. The doctrine of emergent evolution is the Declaration of Independence for biological science."

The principle of emergence should also provide us with a means of escape from many of the antinomies, or "contingencies", as they are called by Adolf Meyer, in domains other than the bio-

logical. One of the most serious of these in biology, that of preformation and epigenesis, was resolved after experimentation on the development of living, and the study of the phylogeny of living and extinct organisms had demonstrated that there is both genetic continuity and discontinuity, or the production of novelty in living things; in other words, that evolution is not exclusively a repetitive but also a creative process. With extension of the concepts of emergence and organicism also to the physical, chemical, psychological and social domain, there arises the strong probability that the old "nothing but" attitudes of naturalism *versus* supernaturalism, materialism *versus* spiritualism, mechanism *versus* vitalism, determinism *versus* freedom, and pluralism *versus* monism, etc., may be abandoned and the way opened for a more consistent and more satisfying view of universal reality.

LITERATURE

1920. ALEXANDER, S., *Space, Time and Deity.* (Gifford Lectures at Glasgow, 1916-1918), 2 vols. London and New York.

1927. ALVERDES, F., *Social Life in the Animal World.* New York.

1922. BARTH, P., *Die Philosophie der Geschichte als Soziologie.* I. Leipzig.

1927. BERNARD, CLAUDE, *An Introduction to the Study of Experimental Medicine.* Transl. by H. C. Greene, New York.

1848. DU BOIS-REYMOND, E., *Untersuchungen über thierische Elektricität,* Bd. I., Berlin.

1915. BRISTOL, L. M., *Social Adaptation.* Cambridge, Mass.

1925. BROAD, C. D., *The Mind and Its Place in Nature* (International Library of Psychology, etc.), London and New York.

1926. BROWN, H. C., "A Materialist's View of the Concept of Levels," *Journ. Philos.* XXIII, p. 113-120.

1925. CONGER, G. P., "The Doctrine of Levels," *Journ. Philos.,* XXII, pp. 309-321.

1918. DEEGENER, P., *Die Formen der Vergesellschaftung im Tierreiche.* Leipzig.

1908. DRIESCH, HANS, *The Science and Philosophy of the Organism* (Gifford Lectures, 1907 and 1908, Univ. at Aberdeen). London and New York.

1925. ELDRIDGE, SEBA, *The Organization of Life,* New York.

1927. ELTON, C., *Animal Ecology.* New York.

1877. ESPINAS, *A., Les Sociétés Animales. Etude de Psychologie Comparée.* Paris.

1915. FERRIÈRE, A., *La Loi du Progrès en Biologie et en Sociologie et la Question de l'Organisme Social.* Paris.

1926. GORDON, R. G., *Personality* (International Library of Psychology, etc.).

1917. HENDERSON, L. J., *The Order of Nature.* Harvard.

1926. HERRICK, C. J., *Brains of Rats and Men.* Chicago.

1922. HERTWIG, O., *Das Werden der Organismen,* 3rd edit. Jena.

1926. HOERNLÉ, R. F. A., A Modern Philosopher King, *New Republic,* Dec. 8, 1926, pp. 88-89.

1914. HOLT, E. B., *The Concept of Consciousness.* London and New York.

1918. JENNINGS, H. S., "Mechanism and Vitalism," *Philos. Review,* XXVII, pp. 577-596.

1927. JENNINGS, H. S., "Diverse Doctrines of Evolution, Their Relation to the Practice of Science and Life," *Science,* LXV, pp. 19-25.

1875. LEWES, G. H., *Problems of Life and Mind,* 2 vols. London and Boston.

1927. LOVEJOY, A. O., "The Meaning of 'Emergence' and Its Modes," *Journ. Philos. Studies,* II, pp. 167-189.

1922. MALINOWSKI, B., *Argonauts of the Western Pacific.* London and New York.

1925. MELIN, E., *Untersuchungen über die Bedeutung der Baummykorrhiza.* Jena.

1887. MILL, J. S., *A System of Logic Ratiocinative and Inductive,* 8th ed. London and New York.

1915. MORGAN, C. LLOYD, "Mind and Body in Their Relation to Each Other and to External Things," *Scientia,* XVIII.

1926. MORGAN, C. LLOYD, *Emergent Evolution* (Gifford Lectures, Univ. at St. Andrew's, 1922). London and New York.

1926. NORDENSKIÖLD, E., *Die Geschichte der Biologie,* Germ. translation by G. Schneider. Jena.

1926. OGDEN, C. K., *The Meaning of Psychology.* New York.

1917. PARETO, V., *Traité de Sociologie Générale.* 2 vols. Lausanne and Paris.

1924. PARKER, G. H., "Organic Determinism," *Science* N. S., LIX, pp. 518-521.

1924. PARKER, G. H., "Some Implications of the Evolutionary Hypothesis," *Philos. Review,* XXIII, pp. 593-603.

1926. PARKER, G. H., "The Evolution of Mind," *Harvard Alumni Bull.,* June 10, pp. 1045-1054.

1906. PETRUCCI, R., "Origine polyphylétique Homotypie et Noncomparabilité directe des Sociétés Animales," Fasc. 7, *Notes et Mém Inst. Solvay.*

1922. RAINES, M. A., "Vegetative Vigor of the Host as a Factor Influencing Susceptibility and Resistance to Certain Rust Diseases of the Higher Plants," *Amer. Journ. Botany,* IX, pp. 183-202, 215-238. 2 pls.

1926. REISER, O. L., "Probability, Natural Law and Emergence," *Journ. Philos.,* XXIII, pp. 421-435.

1926. ROBERTS, M., *Malignancy and Evolution.* London.

1926. ROBERTSON, HON. J. M., "A Soldier-Statesman's Philosophy," *Literary Guide,* No. 366 (n.s.) Dec. 1926, pp. 205-206.

1926. RUSSELL, E. S., MORRIS, C. R. and SIR W. LESLIE MACKENZIE, Symposium: "The Action of Emergence," Aristotle Soc., Suppl. Vol. VI, pp. 39-68.

1922. SELLARS, R. W., *Evolutionary Naturalism.* Chicago and London.

1926. SMUTS, GEN. J. C., *Holism and Evolution.* London and New York.

1918. SPAULDING, E. G., *The New Rationalism.* New York.

1923. SPEARMAN, C., *The Nature of 'Intelligence' and the Principles of Cognition.* New York.

1871. SPENCER, H., *Principles of Biology,* 2 vols. New York.

1927. SUMNER, W. G. and KELLER, A. G., *The Science of Society,* 4 vols. New Haven.

1894. WARD, L. F., *Dynamic Sociology,* 2 vols. New York.

1903. WARD, L. F., *Pure Sociology.* New York.

1906. WAXWEILER, E., "Equisse d'une Sociologie," Fasc. 2, *Notes et Mém. Inst. Solvay.*

1911. WHEELER, W. M., "The Ant Colony as an Organism," *Journ. Morph.* 22, pp. 307-325.

1923. WHEELER, W. M., *Social Life among the Insects.* New York and London.

1926. WHEELER, W. M., *Les Sociétés d'Insectes. Leur Origine. Leur Evolution.* Paris. English Edition, International Library of Psychology. London and New York. 1928.

1925. WHITEHEAD, A. N., *Science and the Modern World.* London and New York.

1903. WUNDT, W., *Grundzüge der Physiologischen Psychologie,* 3 vols., 5th edit. Leipzig.

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